SECONDARY MATH I // MODULE 7
CONGRUENCE, CONSTRUCTION AND PROOF- 7.1

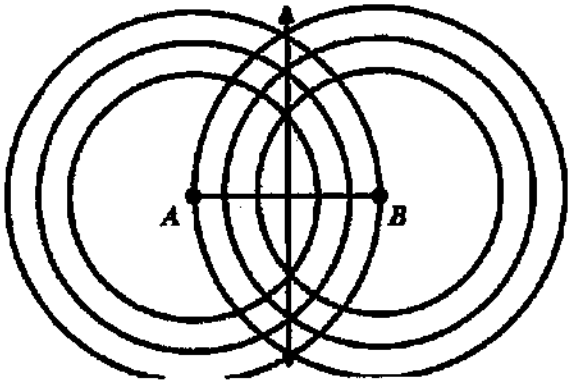
7.1

READY, SET, GO! Name Period Date

READY

Topic: Tools for construction and geometric work.

1. Using your compass draw several concentric circles that have point A as a center and then draw those same sized concentric circles that have B as a center. What do you notice about where all the circles with center A intersect all the corresponding circles with center B?



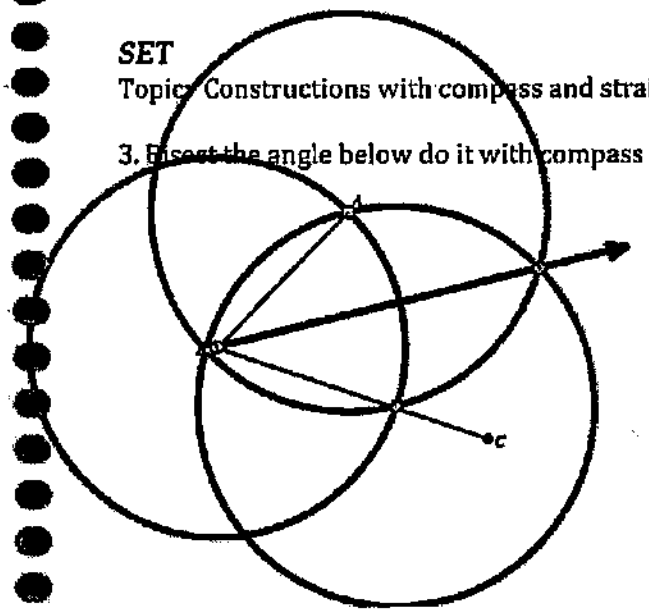
2. In the problem above you have demonstrated one way to find the midpoint of a line segment. Explain another way that a line segment can be bisected without the use of circles.

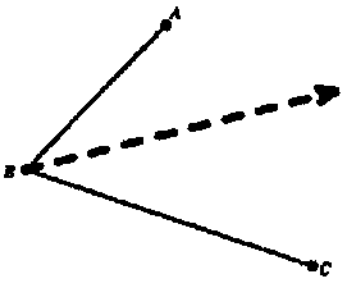
[redacted]

SET

Topic: Constructions with compass and straight edge.

3. Bisect the angle below do it with compass and straight edge as well as with paper folding.





Answer: There should be a fold through point B so the rays forming the angle coincide.

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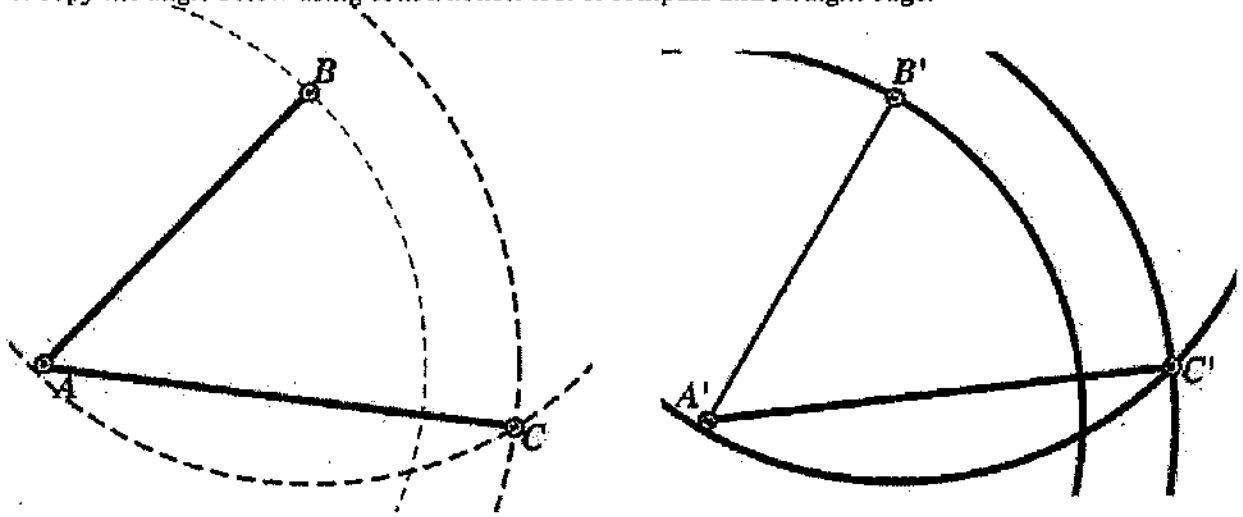
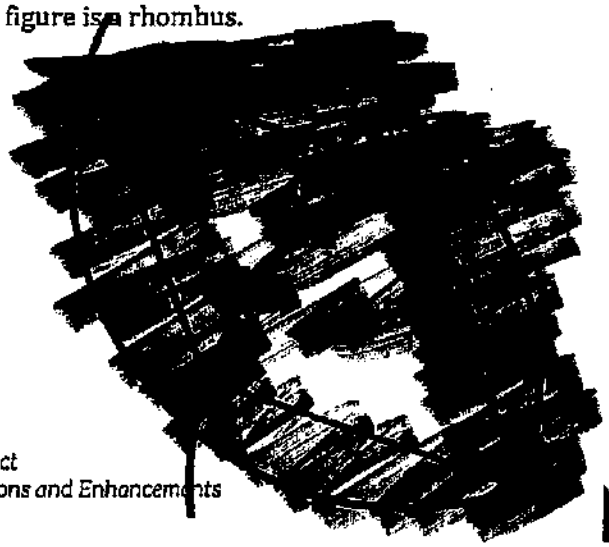
4. Copy the segment below using construction tools of compass and straight edge, label the image ***D'E'***.

5. Copy the angle below using construction tool of compass and straight edge.



6. Construct a rhombus on the segment AB that is given below and that has point A as a vertex. Be sure to check that your final figure is a rhombus.



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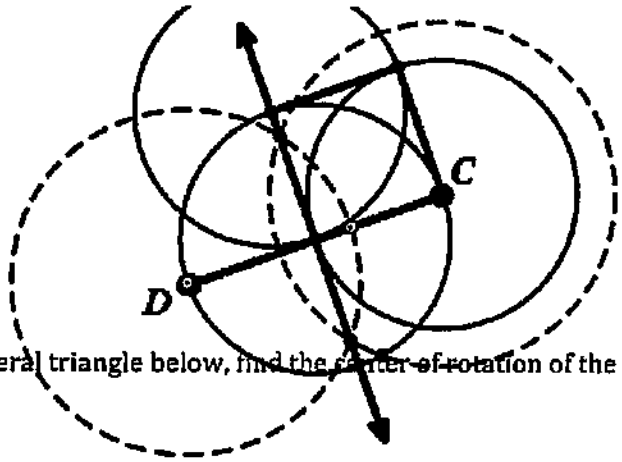
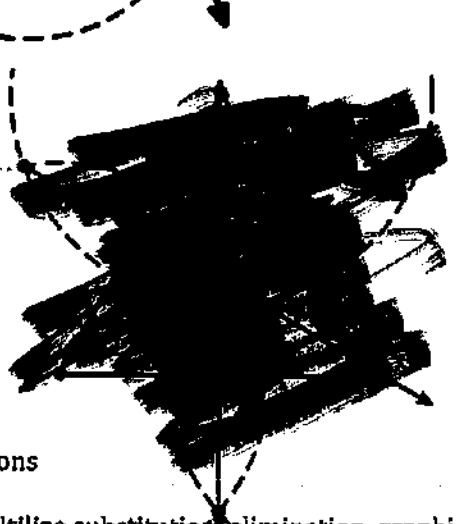
7. Construct a square on the segment CD that is given below. Be sure to check that your final figure is a square.



8. Given the equilateral triangle below, find the center of rotation of the triangle using compass and straight edge.



GO

Topic: Solving systems of equations

Solve each system of equations. Utilize substitution, elimination, graphing or matrices.

9. $\begin{cases} x = 11 + y \\ 2x + y = 19 \end{cases}$

Answer:

$(8, -3)$

10. $\begin{cases} -4x + 9y = 9 \\ x - 3y = -6 \end{cases}$

Answer:

[redacted]

11. $\begin{cases} x + 2y = 11 \\ x - 4y = 2 \end{cases}$

Answer:

$(8, \frac{3}{2})$

12. $\begin{cases} y = -x + 1 \\ y = 2x + 1 \end{cases}$

Answer:

[redacted]

13. $\begin{cases} y = -2x + 7 \\ -3x + y = -8 \end{cases}$

Answer:

$(3, 1)$

14. $\begin{cases} 4x - y = 7 \\ -6x + 2y = 8 \end{cases}$

Answer:

[redacted]

SECONDARY MATH I // MODULE 7
CONGRUENCE, CONSTRUCTION AND PROOF- 7.2

7.2

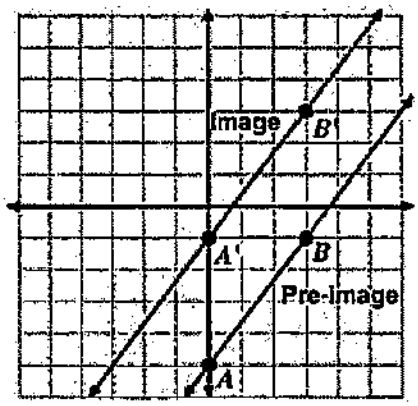
READY, SET, GO! Name Period Date

READY

Topic: Transformation of lines, connecting geometry and algebra.

For each set of lines use the points on the line to determine which line is the image and which is the pre-image, write image by the image line and pre image by the original line. Then define the transformation that was used to create the image. Finally find the equation for each line.

1.

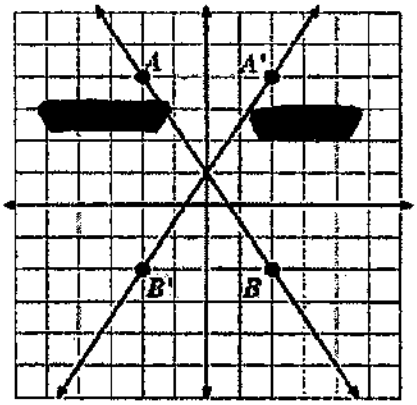


a. Description of Transformation:
Answer: Translation up 4 *or* $(x, y+4)$

b. Equation for pre-image:
Answer: $y = \frac{4}{3}x - 5$

c. Equation for image:
Answer: $y = \frac{4}{3}x - 1$

2.

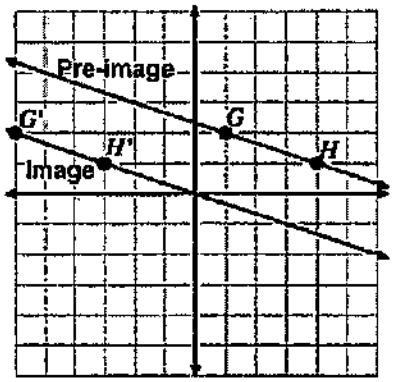


a. Description of Transformation:
[redacted]

b. Equation for pre-image:
[redacted]

c. Equation for image: **Answer:** [redacted]

3.

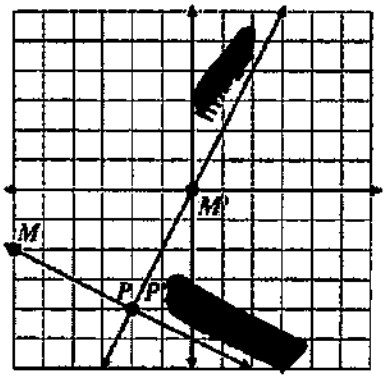


a. Description of Transformation:
Answer: Translation left 7 *or* $(x-7, y)$

b. Equation for pre-image:
Answer: $y = -\frac{1}{3}(x-1) + 2$ *or* $y = -\frac{1}{3}x + 2\frac{1}{3}$

c. Equation for image:
Answer: $y = -\frac{1}{3}x$

4.



a. Description of Transformation:
[redacted]

b. Equation for pre-image:
[redacted]

c. Equation for image:
Answer: [redacted]

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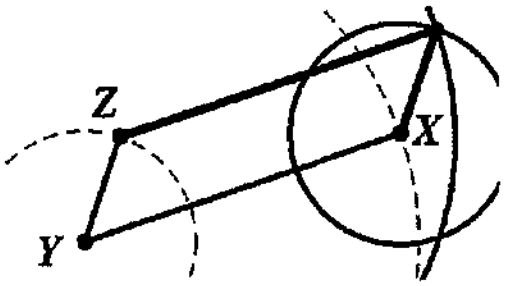
7.2

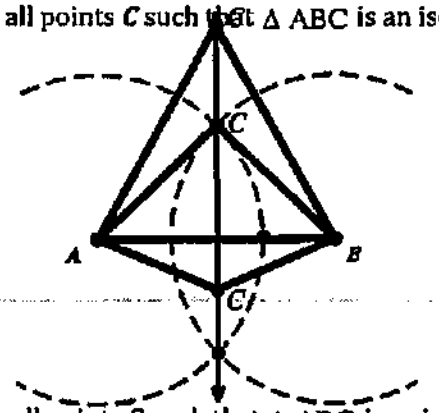
SET
Topic: Geometric constructions with compass and straight edge.

5. Construct a parallelogram given sides $\overline{XY}$ and $\overline{YZ}$ and $\angle XYZ$.



6. Construct a line parallel to $\overline{QT}$ and through point R.

7. Given segment $\overline{AB}$ show all points C such that Δ ABC is an isosceles triangle.



Answer:

C could be any point on the perpendicular bisector of AB. There are an infinite number of isosceles triangles ABC.

8. Given segment $\overline{AB}$ show all points C such that Δ ABC is a right triangle.

Answer:

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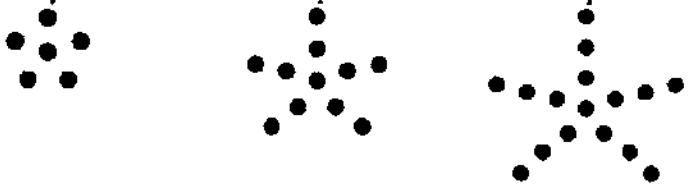
GO

Topic: Creating explicit and recursive rules for visual patterns

9. Find an explicit function rule and a recursive rule for dots in step n.

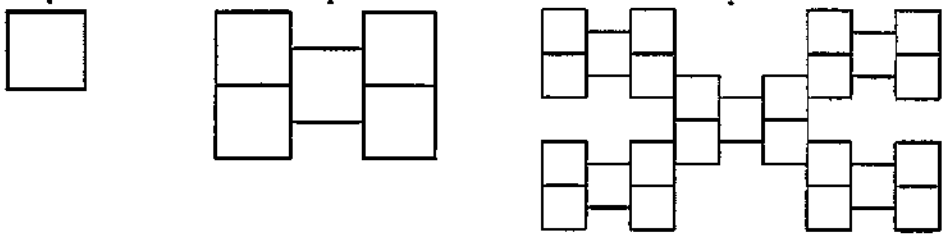
Step 1 Step 2 Step 3



Answer:
Recursive: $f(1) = 6$
$f(n) = f(n-1) + 5$
Explicit:
$f(n) = 5(x-1) + 6$
or
$f(n) = 5x + 1$

10. Find an explicit function rule and a recursive rule for squares in step n.

Step 1 Step 2 Step 3



Answer:
[redacted]

Find an explicit function rule and a recursive rule for the values in each table.

11.

Step	Value
1	1
2	11
3	21
4	31

Answer:
Recursive: $f(1) = 1$
$f(n) = f(n-1) + 10$
Explicit:
$f(n) = 10(x-1) + 1$
or
$f(n) = 10x - 9$

12.

n	$f(n)$
2	16
3	8
4	4
5	2

Answer:
Recursive:
[redacted]
Explicit:
[redacted]

13.

n	$f(n)$
1	-5
2	25
3	-125
4	625

Answer:
Recursive:
$f(1) = -5$
$f(n) = -5f(n-1)$
Explicit:
$f(n) = -5(-5)^{x-1}$
or
$f(n) = -5^x$

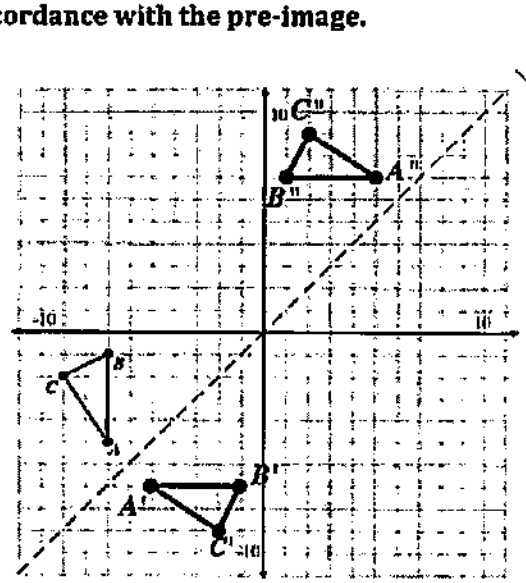
7.3

READY, SET, GO! Name Period Date

READY

Topic: Multiple transformations

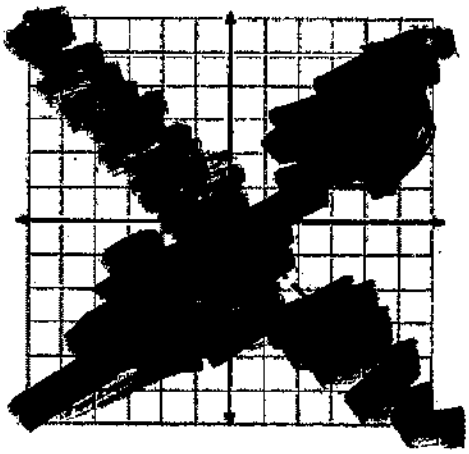
The given figures are to be used as pre-images. Perform the stated transformations to obtain an image. Label the corresponding parts of the image in accordance with the pre-image.



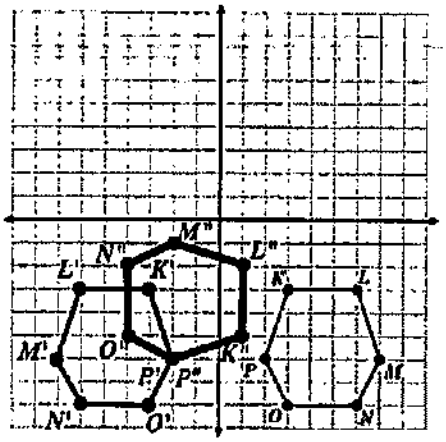
1. Reflect triangle ABC over the line $y = x$ and label the image $A'B'C'$.

   Rotate triangle $A'B'C'$ 180° counter clockwise around the origin and label the image $A''B''C''$.

2. Reflect over the line $y = -x$.



3. Reflect over y-axis and then Rotate clockwise 90° around P'.



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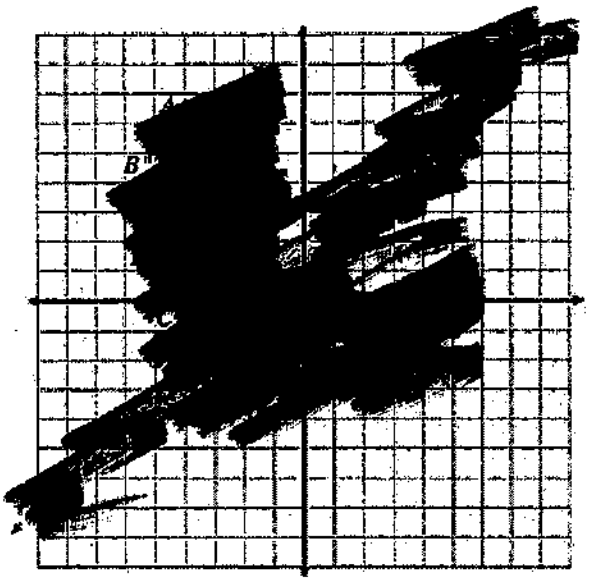
4. Reflect quadrilateral ABCD over the line $y = 2 + x$ and label the image A'B'C'D'.

Rotate quadrilateral A'B'C'D' counter-clockwise 90° around (-2, -3) as the center of rotation label the image A"B"C"D".

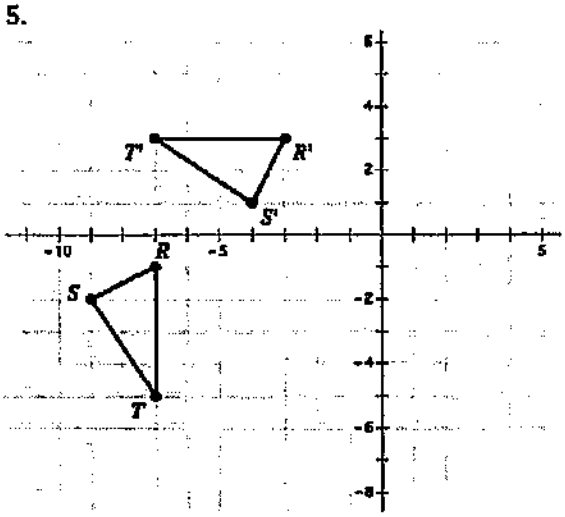


SET

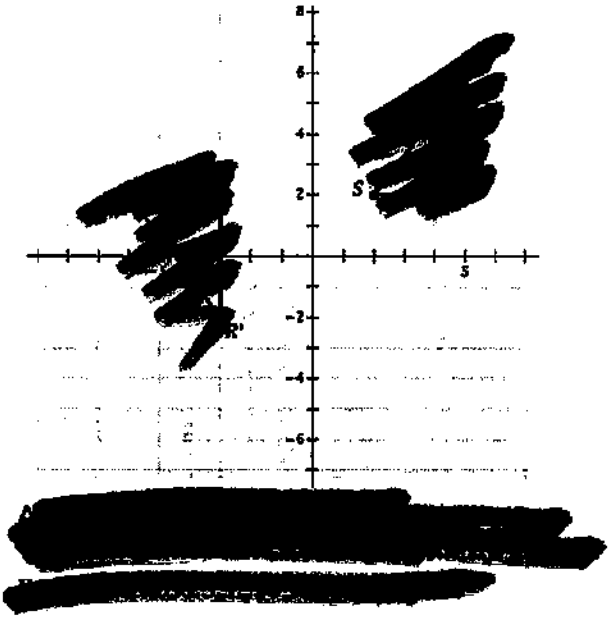
Topic: Find the sequence of transformations.

Find a sequence of transformations that will carry triangle *RST* onto triangle *R'S'T'*. Clearly describe the sequence of transformations below each grid.

5.



6.



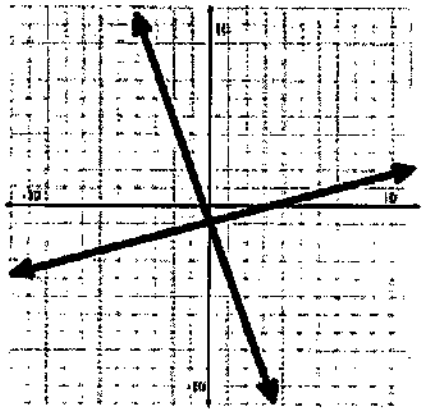
Answers may vary. Possible answer:
Translate Δ *RST* up 8 so T coincides with T'.
Rotate 90° Clockwise about T' until TR coincides with T'R'.
Reflect across T'R' so S lands on S'.

GO

Topic: Graphing systems of functions and making comparisons.

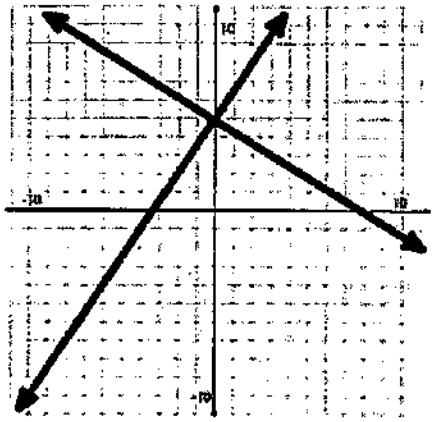
Graph each pair of functions and make an observation about how the functions compare to one another.

7. $y = \frac{1}{3}x - 1$
$y = -3x - 1$



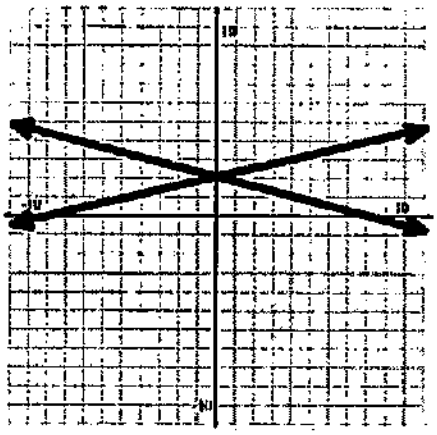
Answer: [redacted]

8. $y = -\frac{2}{3}x + 5$
$y = \frac{3}{2}x + 5$



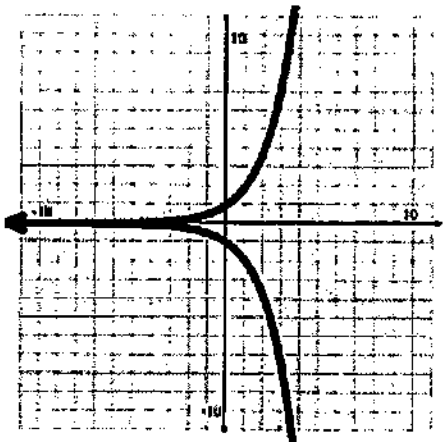
Answer: Perpendicular

9. $y = \frac{1}{4}x + 2$
$y = -\frac{1}{4} + 2$



Answer: Reflection across $y = 2$ or $x = 0$ (y-axis)

10. $y = 2^x$
$y = -2^x$



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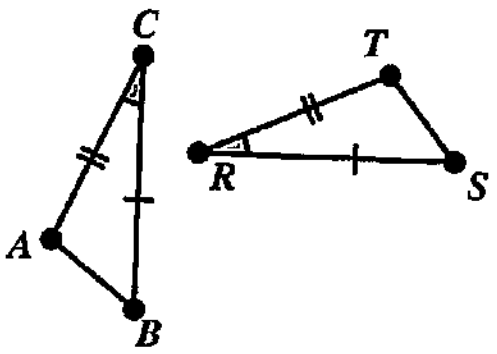
7.4

READY, SET, GO! Name Period Date

READY

Topic: Corresponding parts of figures and transformations.

Given the figures in each sketch with congruent angles and sides marked, first list the parts of the figures that correspond (For example, in #1, $\angle C \cong \angle R$) Then determine if a reflection occurred as part of the sequence of transformations that was used to create the image.



Congruencies

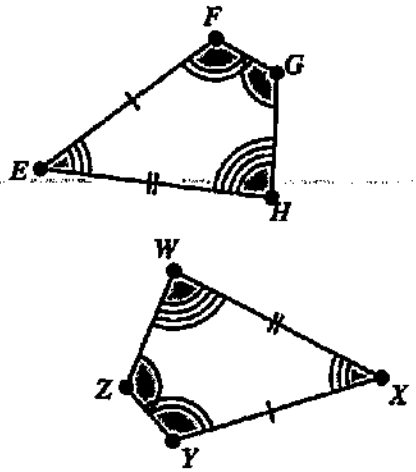
$\angle C \cong \angle R$

Answers:

$\overline{CA} \cong \overline{TR}$

$\overline{CB} \cong \overline{RS}$

Reflected? (Yes) or No



Congruencies

Answers:

[redacted]

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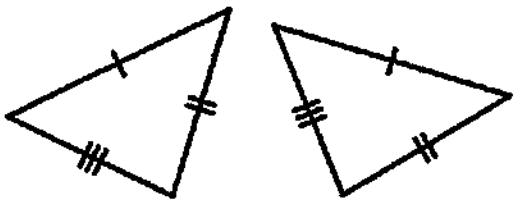
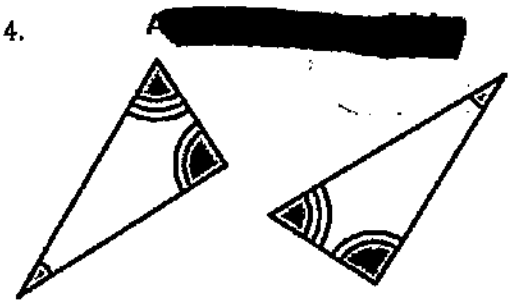
SET
Topic: Triangle Congruence

Explain whether or not the triangles are congruent, similar, or neither based on the markings that indicate congruence.

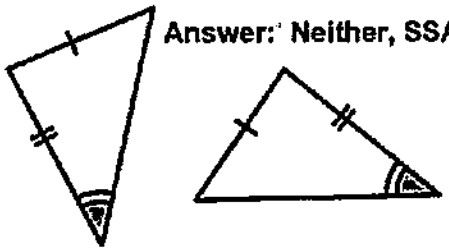
3. **Answer: Congruent, SSS**



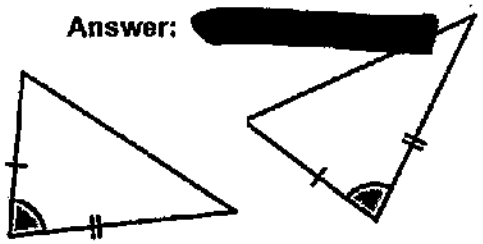
4.



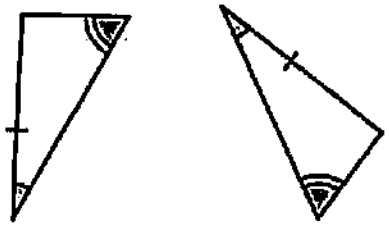
5. **Answer: Neither, SSA**



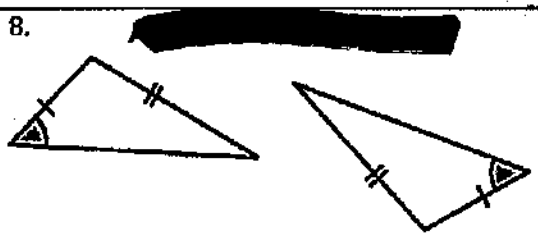
6. **Answer:**



7. **Answer: Congruent, AAS (ASA)**



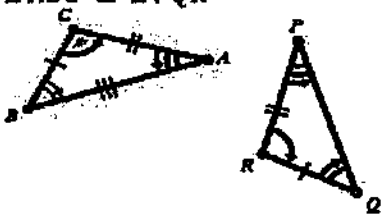
8.



Use the given congruence statement to draw and label two triangles that have the proper corresponding parts congruent to one another.

9. $\Delta ABC \cong \Delta PQR$

Answers will vary. Possible answer:



10. $\Delta XYZ \cong \Delta KLM$

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GO

Topic: Solving equations and finding recursive rules for sequences.

Solve each equation for *t*.

11. $\frac{3t-4}{5} = 5$

Answer:

$t = \frac{29}{3}$

12. $10 - t = 4t + 12 - 3t$

Answer:

[redacted]

13. $P = 5t - d$

Answer:

$t = \frac{P + d}{5}$

14. $xy - t = 13t + w$

Answer:

[redacted]

Use the given sequence of number to write a recursive rule for the *n*th value of the sequence.

15. 5, 15, 45, ...

Answer:

$f(n) = f(n-1) \cdot 3$

$f(1) = 5$

16. $\frac{1}{2}, 0, -\frac{1}{2}, -1, \ldots$

Answer:

[redacted]

17. 3, -6, 12, -24, ...

Answer:

$f(n) = f(n-1) \cdot (-2)$

$f(1) = 3$

18. $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \ldots$

Answer:

[redacted]

7.5

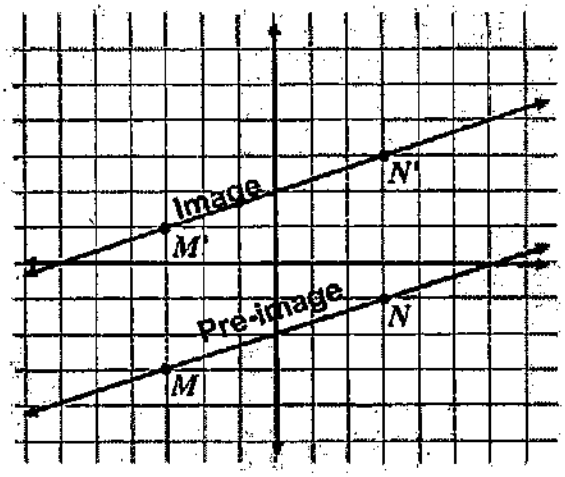
READY, SET, GO! Name Period Date

READY

Topic: Transformations of lines, connecting geometry and algebra.

For each set of lines use the points on the line to determine which line is the image and which is the pre-image, write image by the image line and pre image by the original line. Then define the transformation that was used to create the image. Finally find the equation for each line.

1.



a. Description of Transformation:

Answer: Translation up 4 or $(x, y+4)$

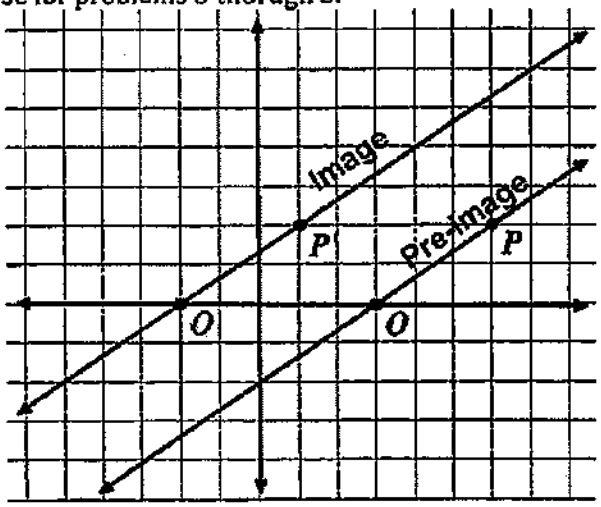
b. Equation for pre-image:

Answer: $y = \frac{1}{3}x - 2$

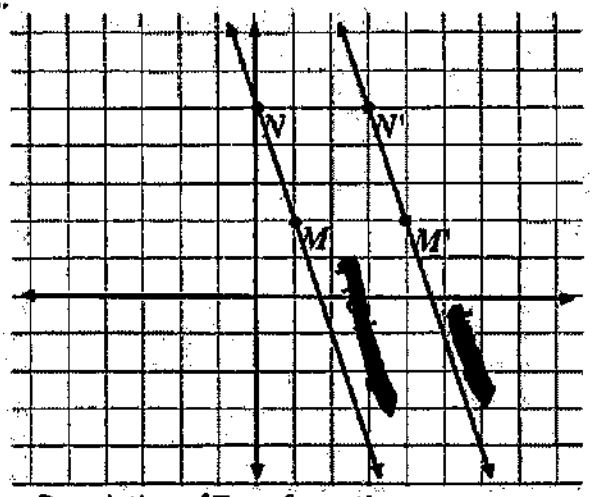
c. Equation for image:

Answer: $y = \frac{1}{3}x + 2$

Use for problems 3 thorugh 5.



2.



a. Description of Transformation:

A[redacted]

b. Equation for pre-image:

[redacted]

c. Equation for image:

[redacted]

3. a. Description of Transformation:

Answer: Translation left 5 or $(x-5, y)$

b. Equation for pre-image:

Answer: $y = \frac{2}{3}x - 2$

c. Equation for image:

Answer: $y = \frac{2}{3}(x-1) + 2$

4. Write an equation for a line with the same slope that goes through the origin.

[redacted]

5. Write the equation of a line perpendicular to these and though the point O'.

Answer: $y = \frac{-3}{2}(x+2)$

or $y = \frac{-3}{2}x - 3$

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After working with these equations and seeing the transformations on the coordinate graph it is good timing to consider similar work with tables.

6. Match the table of values below with the proper function rule.

I [redacted]

x	$f(x)$
-1	16
0	14
1	12
2	10

II [redacted]

x	$f(x)$
-1	14
0	12
1	10
2	8

III [redacted]

x	$f(x)$
-1	12
0	10
1	8
2	6

IV [redacted]

x	$f(x)$
-1	10
0	8
1	6
2	4

V [redacted]

x	$f(x)$
-1	8
0	6
1	4
2	2

A. $f(x) = -2(x-1)+8$

B. $f(x) = -2(x-1)+12$

C. $f(x) = -2(x-2)+8$

D. $f(x) = -2(x+1)+8$

E. $f(x) = -2(x+1)+10$

SET

Topic: Use Triangle Congruence Criteria to justify conjectures.

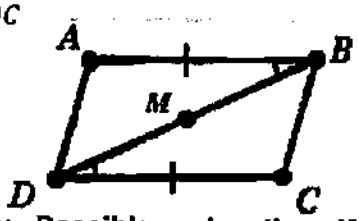
In each problem below there are some true statements listed. From these statements a conjecture (a guess) about what might be true has been made. Using the given statements and conjecture statement create an argument that justifies the conjecture.

7. True statements:

Point M is the midpoint of $\overline{DB}$

$\angle ABD \cong \angle BDC$

$\overline{AB} \cong \overline{DC}$



Conjecture: $\angle A \cong \angle C$

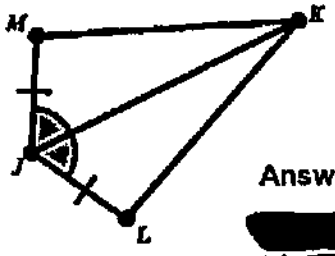
a. Is the conjecture correct?

Answer: Yes

b. Argument to prove you are right:

Answers may vary. Possible explanation: We know that $\overline{AB} \cong \overline{DC}$ and $\angle ABD \cong \angle BDC$. Since $\overline{BD}$ is a shared side for ΔABD and ΔCDB, these triangles are congruent because of SAS. $\angle A$ and $\angle C$ are corresponding angles of these congruent triangles so they are congruent.

8. True statements
$\angle KJL \cong \angle KJM$
$\overline{JL} \cong \overline{JM}$



Conjecture: $\overline{JK}$ bisects $\angle MKL$
a. Is the conjecture correct?

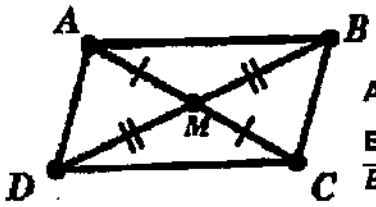
[redacted]

b. Argument to prove you are right:

Answer:

[redacted]

9. True statements
ΔADM is a 180° rotation of ΔCMB



Conjecture: $\Delta ABM \cong \Delta CDM$
a. Is the conjecture correct?
Answer: Yes
b. Argument to prove you are right:

Answer:

By definition of rotation, $\overline{AM} \cong \overline{CM}$ and $\overline{BM} \cong \overline{DM}$.
$\angle DMC \cong \angle BMA$ because they are vertical angles.
$\Delta ABM \cong \Delta CDM$ because of SAS

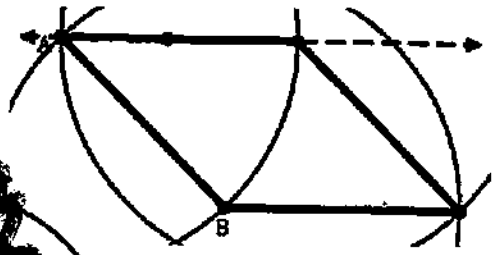
GO
Topic: Constructions with compass and straight edge.

10. Why do we use a geometric compass when doing constructions in geometry?

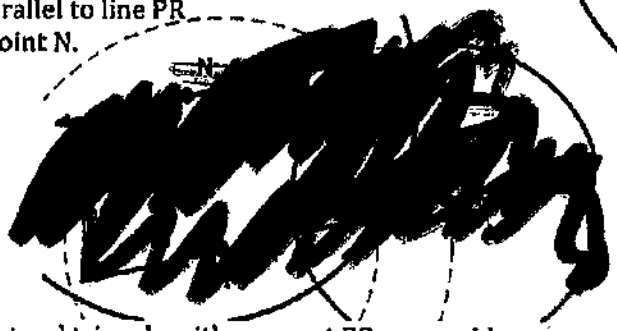
[redacted]

Perform the indicated constructions using a compass and straight edge.

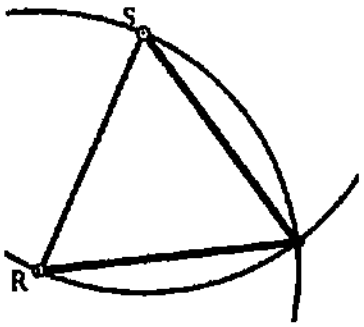
11. Construct a rhombus, use segment AB as one side and angle A as one of the angles.



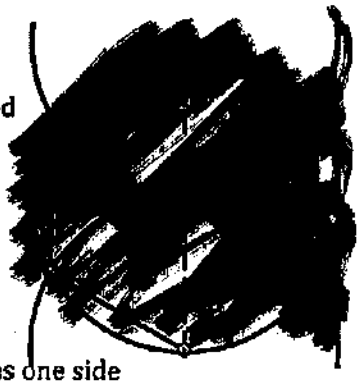
12. Construct a line parallel to line PR and through the point N.



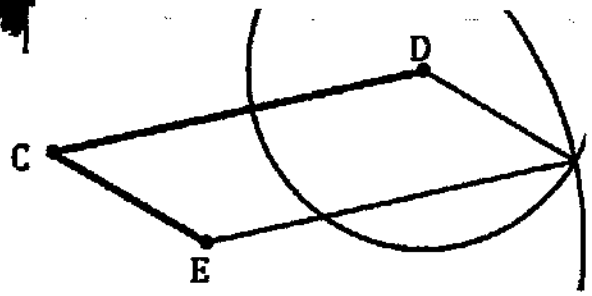
13. Construct an equilateral triangle with segment RS as one side.



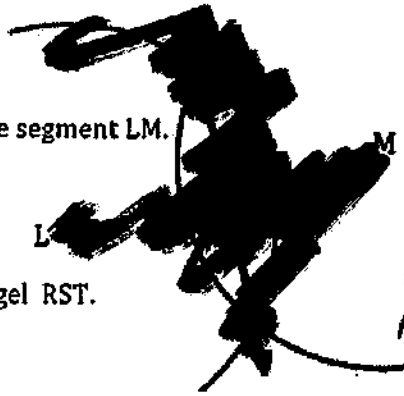
14. Construct a regular hexagon inscribed in the circle provided.



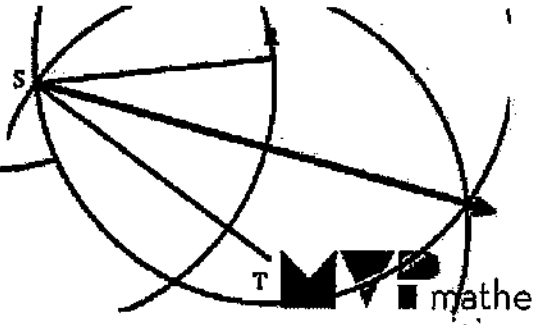
15. Construct a parallelogram using CD as one side and CE as the other side.



16. Bisect the line segment LM.



17. Bisect the angel RST.



7.6

READY, SET, GO! Name Period Date

READY

Topic: Rotational symmetry in regular polygons and with transformations.

1. What angles of rotational symmetry are there for a regular pentagon?

Answers: Multiples of 72° (72, 144, 216, 288, 360)

2. What angles of rotational symmetry are there for a regular hexagon?

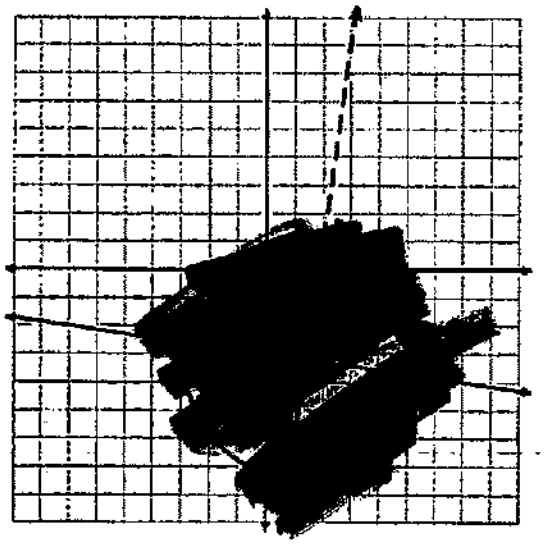
[redacted]

3. If a regular polygon has an angle of rotational symmetry that is 40°, how many sides does the polygon have?

Answers: 9 sides

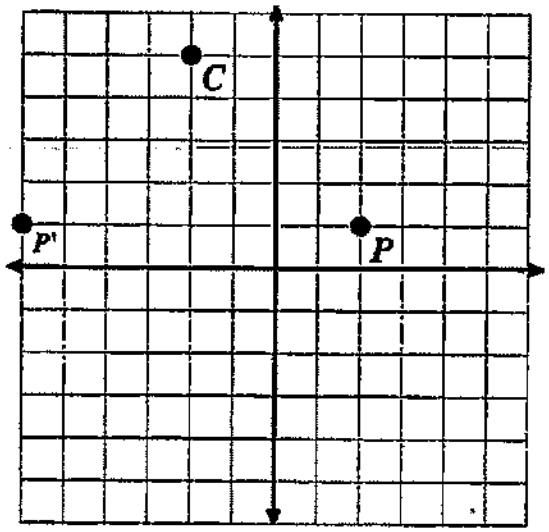
On each given coordinate grid below perform the indicated transformation.

4.



Reflect point P over line j.

5.



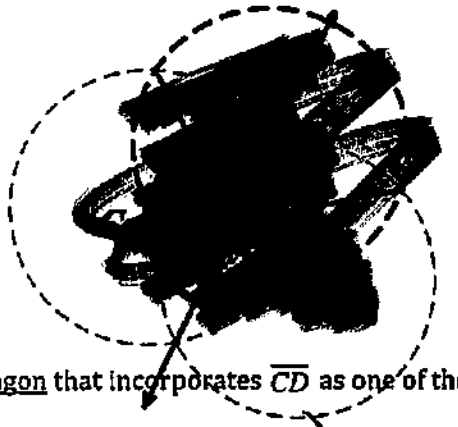
Rotate point P 90° clockwise around point C.

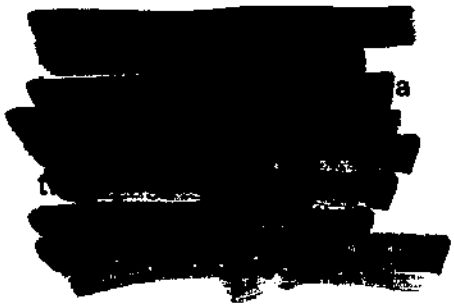
7.6

SET

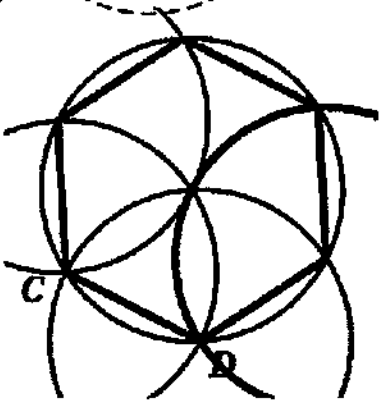
Topic: Use Triangle Congruence Criteria to justify conjectures.

6. Construct an isosceles triangle that incorporates $\overline{CD}$ as one of the sides. Construct the circumscribed circle around the triangle.

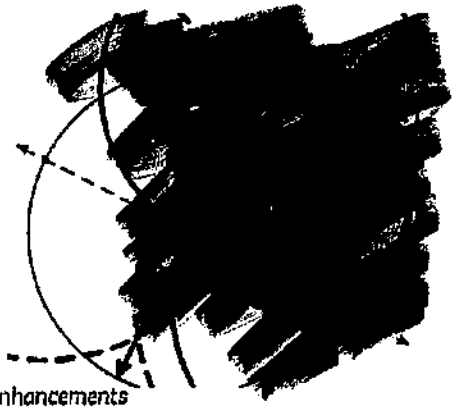




7. Construct a regular hexagon that incorporates $\overline{CD}$ as one of the sides. Construct the circumscribed circle around the hexagon.



8. Construct a square that incorporates $\overline{CD}$ as one of the sides. Construct the circumscribed circle around the square.



GO

Topic: Finding Distance and Slope.

For each pair of given coordinate points find distance between them and find the slope of the line that passes through them. Show all your work.

9. (-2, 8) , (3, -4)
   a. Slope:
   b. Distance:

   Answer: $m = -\frac{12}{5}$

   Answer: $c = 13$

10. (-7, -3) , (1, 5))
    a. Slope:
    b. Distance:

    Answer: [redacted]

    Answer: [redacted]

11. (3, 7) , (-5, 9)
    a. Slope:
    b. Distance:

    Answer: $m = -\frac{1}{4}$

    Answer: $c = \sqrt{68} = 2\sqrt{17}$

12. (1, -5) (-7, 1)
    a. Slope:
    b. Distance:

    Answer: [redacted]

    Answer: [redacted]

13. (-10, 31) (20, 11)
    a. Slope:
    b. Distance:

    Answer: $m = -\frac{2}{3}$

    Answer: $c = \sqrt{1300} = 10\sqrt{13}$

14. (16, -45) (-34, 75)
    a. Slope:
    b. Distance:

    Answer: [redacted]

    Answer: [redacted]